和文の説明は裏面にあります。

TTM-000 SERIES USER'S MANUAL
1/16 DIN. DIGITAL TEMPERATURE CONTROLLER

Thank you for purchasing model **TTM-000 SERIES** Digital Temperature Controller.
Please go through this Instruction Manual carefully and use the unit in proper manner.

NOTICE/WARNING BEFORE OPERATION USE

- When having the purchased controller at hand, please be sure that its unit is a correct model (See the following "Model Configuration").
- The following symbol marks ⚠ provide to prevent incident or damage. Kindly refer to the details of the WARNING/CAUTION when using for the first time.
- Another copy of the user's manual "Advanced Version" is provided at customer's request.

⚠ **WARNING**	Due to mishandling, serious dangers may occur to the operator such as death, electrocution and a skin burn.
⚠ **CAUTION**	Owing to mishandling, it may cause some damage to the unit or the operator getting slight injury.

⚠ CAUTION

- For prevention of its malfunction, do not push the front key with sharp points.
- **Spare terminal must not be used for other purposes**.

⚠ WARNING

- Make sure the correct wiring connection before turning on electricity. Mis-wiring may cause malfunction of the unit and fire.
- Never modify the unit to prevent damage or incident such as malfunction and fire etc.

- Please put this user's manual aside for your reference, when operating the unit.
- Copy or reprint of this manual, wholly or partially, is not allowed.
- The contents of this manual may change without notice in future.

ACCESSORY & CONFIGURATION

1) Please be sure that the unit enclosed in packing carton is **a right model before using**.

2) Kindly check the following accessory being contained in that carton box.
- Installation Attachment (For installation, please see "INSTALLATION AND WIRING" on the back.)
- This user's manual : 1 copy

3) Model Configuration

TTM - □□□ - □ - □ - A □□□
(Model / Input / Output 1 / Option)

CODE	Front Dimensions
002	24×48 mm
004	48×48 mm
X04	48×48 mm
005	96×48 mm
006	48×96 mm
007	72×72 mm
009	96×96 mm

CODE	Input Type
NIL	Thermocouple (K, J, R, T, N, S, B) R.T.D. (Pt100, JPt100)
2	0–5V, 1–5V, 4–20mA

CODE	Output 1
R	Relay contact
P	SSR drive voltage
I	Current 4–20 mA DC

CODE	Option	
B	Output 2 Relay contact	B or P selectable
P	Output 2 SSR drive voltage	
R	EV 2 Relay contact Not optional for TTM-002/004. When DI is selected for TTM-005, 006, 007 or 009, this option is not available.	
D	CT input When DI is selected for TTM-002/004, this option is not usable. When I output (4–20mA) is selected, this option is not provided.	
E	DI(Digital input) When CT is selected for TTM-002/004, this option cannot be obtained. When EV 2 is selected for TTM-005, 006, 007 or 009, this option cannot be chosen.	
M	Communication RS-485	

∗ **A** (EV1) provided in the standard specifications.
∗ Without output 2, EV2 is not available.
∗ Output 2 is equally used as EV2, but both not activated simultaneously.

SPECIFICATIONS

Power Supply Voltage	100 to 240V AC, 50/60Hz
Power Consumption	Below 10 VA
Memory Element	EEPROM
Input of Sensor	Thermocouple, R.T.D./0–5V, 1–5V, 4–20mA (Changeable by front key)
Control Output	**Relay contact, SSR drive voltage, Current**
Control Method	Two kinds of PID, ON/OFF
Operation Environment	0 to 50℃, 20 to 90%RH (Avoid making dew)
Storage Environment	-25 to 70℃, 5 to 95%RH (Avoid making dew)
Weight	TTM-002/004 Less than 180g, TTM-005/006 Less than 240g, TTM-007 Less than 250g, TTM-009 Less than 310g.
Location of the Unit Setting ⚠ CAUTION	Keep away from the followings. • Gas of corrosion, dust and oily smoke. • The electric noise of generator. • The influence of electromagnetic field. • Mechanical vibration and shock. • The direct sunlight.
Installation condition	Installation category II

OPERATION FLOW AND SETTING MENU

Setting display shows the existence of option.

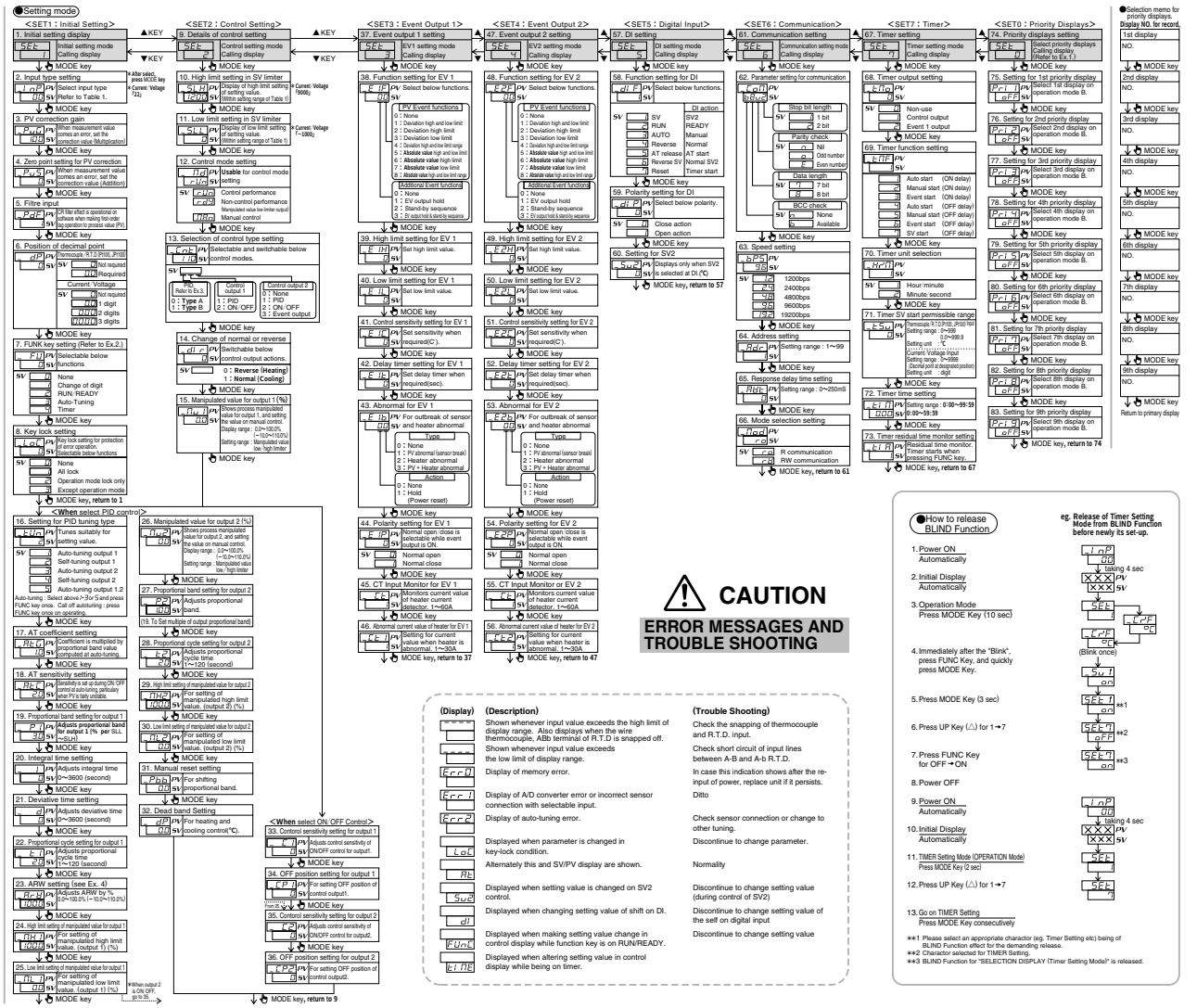
Power ON
Shows for 4 seconds (Warming up)
Operate mode display
A. Primary displays
Process value / Setting value
Set the temperature required
B. Priority displays. Refer to Ex.1. SET0 : Priority displays by setting and shows max.9 displays by setting.
MODE key, return to A
: Press key
MODE key more than 2 seconds
FUNC key
FUNK key operates on the selected setting mode 7. Refer to Ex.2.
Setting mode
<SET1 : Initial Setting>
<SET2 : Control Setting>
<SET3 : Event Output 1>
<SET4 : Event Output 2>
<SET5 : Digital Input>
<SET6 : Communication>
<SET7 : Timer>
<SET0 : Priority Displays>
▲KEY
▼KEY
MODE key
1. Initial setting display
2. Input type setting
3. PV correction gain
4. Zero point setting for PV correction
5. Filtre input
6. Position of decimal point
7. FUNK key setting (Refer to Ex.2.)
8. Key lock setting
9. Details of control setting
10. High limit setting in SV limiter
11. Low limit setting in SV limiter
12. Control mode setting
13. Selection of control type setting
14. Change of normal or reverse
15. Manipulated value for output 1 (%)
38. Function setting for EV 1
39. High limit setting for EV 1
40. Low limit setting for EV 1
41. Control sensitivity setting for EV 1
42. Delay timer setting for EV 1
43. Abnormal for EV 1
44. Polarity setting for EV 1
45. CT Input Monitor for EV 1
46. Abnormal current value of heater for EV 1
48. Function setting for EV 2
49. High limit setting for EV 2
50. Low limit setting for EV 2
51. Control sensitivity setting for EV 2
52. Delay timer setting for EV 2
53. Abnormal for EV 2
54. Polarity setting for EV 2
55. CT Input Monitor or EV 2
56. Abnormal current value of heater for EV 2
58. Function setting for DI
59. Polarity setting for DI
60. Setting for SV2
61. Communication setting
62. Parameter setting for communication
63. Speed setting
64. Address setting
65. Response delay time setting
66. Mode selection setting
67. Timer setting
68. Timer output setting
69. Timer function setting
70. Timer unit selection
71. Timer SV start permissible range
72. Timer time setting
73. Timer residual time monitor setting
74. Priority displays setting
75. Setting for 1st priority display
76. Setting for 2nd priority display
77. Setting for 3rd priority display
78. Setting for 4th priority display
79. Setting for 5th priority display
80. Setting for 6th priority display
81. Setting for 7th priority display
82. Setting for 8th priority display
83. Setting for 9th priority display
Selection memo for priority displays.
Display NO. for record.
Return to primary display
<When select PID control>
16. Setting for PID tuning type
17. AT coefficient setting
18. AT sensitivity setting
19. Proportional band setting for output 1
20. Integral time setting
21. Deviative time setting
22. Proportional cycle setting for output 1
23. ARW setting (see Ex. 4)
24. High limit setting of manipulated value for output 1
25. Low limit setting of manipulated value for output 1
26. Manipulated value for output 2 (%)
27. Proportional band setting for output 2
28. Proportional cycle setting for output 2
29. High limit setting of manipulated value for output 2
30. Low limit setting of manipulated value for output 2
31. Manual reset setting
32. Dead band Setting
<When select ON/OFF Control>
33. Control sensitivity setting for output 1
34. OFF position setting for output 1
35. Control sensitivity setting for output 2
36. OFF position setting for output 2
MODE key, return to 9
MODE key, return to 37
MODE key, return to 47
MODE key, return to 57
MODE key, return to 61
MODE key, return to 67
MODE key, return to 74
Ex.1. Priority displays & its setting
This function is to shift the most essential screens on setting mode into operation mode as a priority. Please select priority displays through priority display setting.
eg. : Basic display → Output 1 manipulated value → Setting high limit for event Output 1
∗Screen is shifted when pressing mode key each time.
Ex.2. FUNC key work
This function is to enable FUNC key to use as a specific key, for the following actions selected in FUNC key setting belonged to setting mode.
1.Digit shift
Setting digit shift is enabled when setting value is changed.
2.RUN /READY
Control stop (READY) and control performance (RUN) are alternately switched every time FUNC key is pressed. (READY lamp is ON during control stop)
3.Auto-Tuning (AT)
AT starts instantly after pressing FUNC key. (Start/ Reset operation is available, each time FUNC key is pressed)
4.Timer
Available for start /reset.
Ex.3. To select PID
Feature of type A and B
Type A Ordinary PID
Type B Over shoot protection PID
If control is unstable under self-tuning, please change to type A or B and also to ON/OFF control.
Ex.4. ARW
Anti-reset wind-up take effect for overshooting by over-integral of PID control action.
•ARW controls integral action(PV accords with SV).
•If integral value goes down, it takes effects.
If integral value is set "0", it stops integral action.

Table1. To select input sensors and setting range. unit:℃

	Symbol	Low limit~High limit	0.0 Setting
00	K Thermocouple	−200~1372	−199.9~990.0
01	J 〃	−200~850	−199.9~850.0
02	R 〃	−0~1700	−
03	T 〃	−200~400	−199.9~390.0
04	N 〃	−200~1300	−199.9~990.0
05	S 〃	−0~1700	−
06	B 〃	−0~1800	−
10	Pt100	−199~500	−199.9~500.0
11	JPt100	−199~500	−199.9~500.0
20	DC0–5V	−1999~9999	−199.9~999.9 / −19.99~99.99 / −1.999~9.999
21	DC1–5V	−1999~9999	−199.9~999.9 / −19.99~99.99 / −1.999~9.999
22	DC4–20mA	−1999~9999	−199.9~999.9 / −19.99~99.99 / −1.999~9.999

∗Either thermocouple or R.T.D. (Pt 100/JPt 100) is selectable for input type, by pressing the front key.
∗Either "**B**" or "**P**" is optional.
∗A (Event 1) : Single alarm is provided in the standard specifications.

Conformed Standards
Safety : EN61010-1(IEC1010-1)
EMI : EN50081-2
EMS : EN50082-2
UL3121-1(UL/CUL)

CAUTION BEFORE CONTROL

- Setting program is stored after power OFF, as non-volatile memory is equipped with TTM-000 SERIES controllers for setting storage.
- Either thermocouple or R.T.D.(Pt 100/**JPt 100) is selectable** input type, but Current/Voltage input needs to be selected individually. For suitable application, please select most appropriate input type and adjust input setup.
- PID or ON/OFF control is selective for the optimal performance and each detail of features is specified in the table on the right side.

	PID Control	ON/OFF Control
Merit	Better control result is achieved as opposed to that of ON/OFF control.	Life span of relay is generally longer, as it is ON when temperature is below SV and it is OFF when temperature is over SV (For heating control).
Demerit	**Life span of relay is shorter, as output exists frequently with relay contact**.	Control value is worse in comparison with that of PID control.

※ PID constants are automatically reckoned up to write in, when control begins or SV is altered on self-tuning.

⚠ CAUTION
ERROR MESSAGES AND TROUBLE SHOOTING

(Display)	(Description)	(Trouble Shooting)
	Shown whenever input value exceeds the high limit of display range. Also displays when the wire thermocouple, ABb terminal of R.T.D is snapped off.	Check the snapping of thermocouple and R.T.D. input.
	Shown whenever input value exceeds the low limit of display range.	Check short circuit of input lines between A-B and A-b R.T.D.
Err0	Display of memory error.	In case this indication shows after the re-input of power, replace unit if it persists.
Err1	Display of A/D converter error or incorrect sensor connection with selectable input.	Ditto
Err2	Display of auto-tuning error.	Check sensor connection or change to other tuning.
LoC	Displayed when parameter is changed in key-lock condition.	Discontinue to change parameter.
AL	Alternately this and SV/PV display are shown.	Normality
Su2	Displayed when setting value is changed on SV2 control.	Discontinue to change setting value (during control of SV2)
dI	Displayed when changing setting value of shift on DI.	Discontinue to change setting value of the self on digital input
FunC	Displayed when making setting value change in control display while function key is on RUN/READY.	Discontinue to change setting value
time	Displayed when altering setting value in control display while being on timer.	

How to release BLIND Function

eg. Release of Timer Setting Mode from BLIND Function before newly its set-up.

1. Power ON Automatically
2. Initial Display Automatically (taking 4 sec)
3. Operation Mode Press MODE Key (10 sec)
4. Immediately after the "Blink", press FUNC Key, and quickly press MODE Key. (Blink once)
5. Press MODE Key (3 sec) ∗1
6. Press UP Key (△) for 1→7 ∗2
7. Press FUNC Key for OFF→ON ∗3
8. Power OFF
9. Power ON Automatically
10. Initial Display Automatically (taking 4 sec)
11. TIMER Setting Mode (OPERATION Mode) Press MODE Key (2 sec)
12. Press UP Key (△) for 1→7
13. Go on TIMER Setting Press MODE Key consecutively

∗1 Please select an appropriate charactor (eg. Timer Setting etc) being of BLIND Function effect for the demanding release.
∗2 Charactor selected for TIMER Setting.
∗3 BLIND Function for "SELECTION DISPLAY (Timer Setting Mode)" is released.

※See also "PARTS INDICATION" & "INSTALLATION AND WIRING" on the reverse.

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